Tata Institute of Fundamental Research
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Webinar

High field science using not-so-intense lasers

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Intense lasers can heat plasma electrons to MeV temperatures, whose expansion into the surrounding vacuum can generate charge separation electric fields with TV/m strength. Within a few microns & on picosecond time scales, ions can be accelerated to several MeV in this region, which can be used to generate compact ion accelerators. The attainable hot electron temperatures & ion energies at a given laser intensity constitutes a fundamental signature of the underlying laser-plasma interaction mechanisms. Scaling laws based on more than two decades of research, firmly establish the need for laser powers approaching 100 Terawatts - which can be delivered only at repetition rates of a few shots every second.

Aiming to produce kHz repetition rate radiation sources, we unexpectedly observed 0.5MeV energy ion beams driven by hot electrons with 1MeV temperatures. Importantly, our laser delivered powers < 0.2 TW, hundred fold lower than requisite by the extant scaling laws. In this talk, I will discuss the key mechanisms underlying the acceleration of ions & the development of the diagnostic techniques used to conduct the experimental measurements.

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11:30 AM